

# PATENT SPECIFICATION

(11) 1330936

DRAWINGS ATTACHED

- (21) Application No. 45122/71 (22) Filed 28 Sept. 1971  
 (31) Convention Application No. 93560 (32) Filed 30 Nov. 1970 in  
 (33) United States of America (US)  
 (44) Complete Specification published 19 Sept. 1973  
 (51) International Classification A24D 1/04 A24F 7/04  
 (52) Index at acceptance  
 A2C 1E2 2B  
 A2M 3N 3X



## (54) IMPROVEMENTS RELATING TO FILTER DEVICES FOR CIGARETTES OR CIGARETTE HOLDERS

We, **BRITISH-AMERICAN TOBACCO COMPANY LIMITED**, a Company incorporated under the laws of Great Britain, of Westminster House, 7, Millbank, London, S.W.1., do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to filter devices for cigarettes or cigarette holders and, more particularly, to an improved filtering element within the mouthpiece of the cigarette or holder which automatically moves toward the smoker as the pressure drop of the filter increases and causes openings in the element and mouthpiece outer band to register, allowing a portion of the inhaled air to be drawn directly from the atmosphere. In conventional ventilated cigarettes the ventilation reduces tar and nicotine excessively during the early puffs.

Earlier patent specifications disclose cigarette filters which seek to remedy this problem by providing perforations or openings to mix air with the smoke, which can be varied by the smoker to suit his taste.

According to the present invention there is provided a filter device for a cigarette or cigarette holder comprising a tube forming the outer wrap of the device and a piston within said tube slidable toward a smoker responsive to suction applied through said tube by the smoker drawing on a cigarette, the face of said piston being perforated and serving as a filter for the cigarette, the side walls of the piston and tube each having openings spaced from each other when the piston is in an initial position prior to smoking of the cigarette, the piston opening(s) being covered by the tube and the tube opening(s) being covered by the piston, said piston opening(s) and tube opening(s) being so aligned that sliding of the piston toward the smoker will cause the opening(s) in the piston and tube to over-

lap and allow air to be drawn from the atmosphere into the smoker's mouth.

Thus during smoking of a cigarette through a filter device in accordance with the invention serving as a mouthpiece the filtering perforations become clogged and the density of the smoke stream is increased causing the pressure drop of the cigarette to increase. The partial vacuum thus created in drawing on the cigarette causes the piston to move toward the smoker. As the piston moves toward the smoker the opening(s) in the piston overlap the opening(s) in the outer wrap allowing a portion of the inhaled air to be drawn from the atmosphere and mix with the air drawn through the tobacco column. Although the opening(s) in the piston and in the outer wrap may be of any shape, it has been found preferable to have the opening(s) in the piston so shaped that the size of the overlap of the opening(s) and the flow of air from the atmosphere will increase as the piston moves toward the smoker.

A preferred embodiment of the invention will now be described by way of example with reference to the accompanying drawing in which:

Figure 1 is a view of a cigarette having a filtering device in accordance with the invention;

Figure 2 is a cross-sectional view along the line 2—2 of Figure 1 and

Figure 3 is a cross-section view along the line 3—3 of Figure 2.

Referring to Figure 1 of the drawings, there is shown a cigarette 10 encased in an outer wrap 12 with a mouthpiece 11. Slidable within the outer wrap 12 is a cup-like piston 13 (Figure 2) provided in its face with holes or perforations 14 which act as a filter for air being drawn through the tobacco 15 providing a resistance to air flow through the piston face of 0.1—1.0 inches H<sub>2</sub>O pressure drop at 17.5 cc/sec flow rate. The piston may be made of various materials, but nylon and polyethylene are the most preferred. It has been

found preferable to use between seven and eleven holes, each having an area of 0.46 square millimeters, although such area may be varied between 0.1 and 0.7 square millimeters.

5 The total area of these holes would be within the approximate range of 1 to 5 square millimeters. The piston has openings in the form of ports 16 in the side covered by the outer wrap. The number of such ports 16 may vary

10 in number from say 1 to 5 and in size, it has been found that three or four ranging from 1 to 16 square millimeters will not weaken or destroy the strength of the piston. There are also openings, i.e. perforations 17 in the outer wrap, which likewise may vary in number and size. In the initial position of the piston, before the cigarette is smoked, the perforations 17 in the outer wrap are covered on the inside

20 by the wall of the piston to prevent air from the atmosphere being inhaled by the smoker through such perforations. The size of the overlap is determined by the size, spacing and number of the perforations in the outer wrap in relation to the size of the ports and is preferably such that the air opening formed at the overlap has a total area ranging in size

25 from .25 to 5 square millimeters. It is desirable to have the overlap of ports and perforations to have a pressure drop approximately between 5 to 30 inches at a 17.5 cc/sec. flow rate. For example, the overlap can provide

30 two openings each with an area of 0.224 square millimeters or one opening with an area of 0.46 square millimeters. The pressure drop of the overlap of the piston ports and the outer wrap perforations must be balanced with the piston face. It is desirable to maintain a total cigarette pressure drop during smoking within reasonable limits between 2

40 and 7 inches  $H_2O$ . Thus, if it is desirable to use a relatively large area for the holes in the piston face, which would subsequently increase pressure drop upon smoking by a small amount, then a relatively small area in the overlap would be necessary to maintain the total cigarette pressure drop within practical limits. Likewise for a small hole area in the piston face, a relatively large overlap area would be required. The equation by which

50 these pressure drops are related is:

$$P_{cig} = \frac{P_2(P_1 + P_2)}{P_2 + P_3 + P_1}$$

where

- $P_1$  is the tobacco section pressure drop;  
 $P_2$  is the pressure drop of the hole in the face of the piston; and  
 $P_3$  is the pressure drop of the overlap.

Each port 16 in the piston is shown in the shape of a triangle with the registering perforations 17 in the outer wrap in the shape of circles. Since the main object is to have the overlapping ports and perforations from an

air opening which will become larger as the piston moves toward the smoker, it will be apparent that such ports can be varied in shape and combinations of shapes to achieve that result. For example, the overlapping ports could be rectangles, circles, triangles or similar figures.

The operation of the filter device should be clear from the foregoing description. The invention provides a device which can be connected to a cigarette either as a cigarette holder or as a unitary filter cigarette. It will be understood that this filter device can also be used with a conventional cellulose acetate filter at either end or inside the piston. It does not detract from the holder or cigarette, is simple and economical to manufacture, and operates effectively.

#### WHAT WE CLAIM IS:—

1. A filter device for a cigarette or cigarette holder comprising a tube forming the outer wrap of the device and a piston within said tube slidable toward a smoker responsive to suction applied through said tube by the smoker drawing on a cigarette, the face of said piston being perforated and serving as a filter for the cigarette, the side walls of the piston and tube each having openings spaced from each other when the piston is in an initial position prior to position prior to smoking of the cigarette, the piston opening(s) being covered by the tube and the tube opening(s) being covered by the piston, said piston opening(s) and tube opening(s) being so aligned that sliding of the piston toward the smoker will cause the opening(s) in the piston and tube to overlap and allow air to be drawn from the atmosphere into the smoker's mouth.

2. The filter device of claim 1 wherein the number and size of perforations in the face of the piston is such that the resistance of air flow through the piston face is within the values defined by 0.1—1.0 inches  $H_2O$  pressure drop at 17.5 cc/sec. flow rate.

3. The filter device of claim 1 or 2 wherein the number of perforations in the face of the piston is between seven and eleven.

4. The filter device of claim 3 wherein the area of each perforation is between 0.1 and 0.7 square millimeters.

5. The filter device of anyone of the preceding claims wherein the number of openings in the side wall of the piston is between one and five.

6. The filter device of claim 5 wherein the overlapping openings in the tube and piston form an air opening having a total area ranging in size from .25 to 5 square millimeters.

7. The filter device of any one of the preceding claims wherein the openings in the piston are shaped so that the air opening formed by the overlapping openings in the

tube and piston increases in dimension as the piston slides from its initial position to a position where the openings in the tube fully register with the openings in the piston.

- 5 8. The filter device of claim 7 wherein the openings in the piston are triangles with their apices pointing in the direction of the smoker.
9. A filter device substantially as herein-

before described with reference to the accompanying drawing.

10

JENSEN & SON,  
Agents for the Applicants,  
8, Fulwood Place,  
London, WC1V 6HG.  
Chartered Patent Agents.

Printed for Her Majesty's Stationary Office, by the Courier Press, Leamington Spa, 1973.  
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from  
which copies may be obtained.

FIG. 1

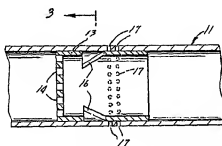
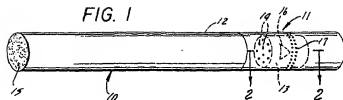


FIG. 2

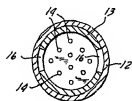


FIG. 3